314/C

Multi objective optimization of municipal waste management systems adapted to the Sri Lankan context

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Decision making related to integrated solid waste management is a complex process as it combines a number of activities such as waste generation, collection, thermal and biological conversion, material recovery, land filling, etc. In such circumstances energy recovery through thermal conversion of municipal solid waste is been considered world wide as a potential waste management technique and as a solution to ever-increasing energy demands. In order to evaluate the applicability of these phenomena in Sri Lanka, this project models energy flow, material flow and cash flow for three cases i.e. direct thermal conversion of waste, thermal conversion through Residue Derived Fuel (RDF) and land filling. Based on the mathematical model Net Present Value (NPV) of the entire cash flows and the land filling capacity of the entire life cycle were taken as the objective functions to be minimized. The fraction of waste to be directly incinerated (W_{DI}), converted to RDF (W_R), directly used at land fills (W_{LF}), and thermal conversion method for RDF, direct incineration were taken as the decision space variables. The steady state ε evolutionary multi objective optimization technique was used to obtain the Pareto fronts. The results show that direct thermal conversion is the only option when there are limitations with the land filling option. With the increase of land filling a significant increase in W_R can be observed while the NPV is reduced.

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